

Dissolved Oxygen

Aquatic plants add oxygen to lake water through photosynthesis, although some of that oxygen may get used up when dead plants decay.

Dissolved oxygen is considered an important measurement of water quality because it is essential for aquatic communities. Without oxygen, a lake would be devoid of all animal life. Changes in dissolved oxygen levels can occur for a variety of reasons, including water temperature, wind action and the amount of algae and aquatic plants in the lake. When algae and aquatic plants decay, the bacteria that decompose them use up dissolved oxygen. Excess algae can result in extensive bacterial growth and accompanying low oxygen levels. While fish can often swim away from areas with low oxygen, benthic macroinvertebrates may be trapped in low-oxygen zones. The EPA used the mean surface concentration (from the top 2 meters) to determine the condition class, using the same benchmarks in all ecoregions:

- Good: ≥ 5 ppm.
- Fair: > 3 ppm but < 5 ppm.
- Poor: ≤ 3 ppm.

Because oxygen levels can vary with depth, EPA scientists are researching a new indicator based on dissolved oxygen that would use additional data from a greater portion of the water column.



Indicators: Dissolved Oxygen

What is dissolved oxygen?

Dissolved oxygen (DO) is the amount of oxygen that is present in water. Water bodies receive oxygen from the atmosphere and from aquatic plants. Running water, such as that of a swift moving stream, dissolves more oxygen than the still water of a pond or lake.

Why is it important to evaluate dissolved oxygen?

All aquatic animals need DO to breathe. Low levels of oxygen (hypoxia) or no oxygen levels (anoxia) can occur when excess organic materials, such as large algal blooms, are decomposed by microorganisms. During this decomposition process, DO in the water is consumed. Low oxygen levels often occur in the bottom of the water column and affect organisms that live in the sediments. In some water bodies, DO levels fluctuate periodically, seasonally and even as part of the natural daily ecology of the aquatic resource. As DO levels drop, some sensitive animals may move away, decline in health or even die.

<https://epa.gov/sites/production/files/2014-04/flickr_user_usfws_-_pacific_region_-_roger_tabor2.jpg>



Salmon need oxygen rich water like the Ebright Creek in Washington. Source: Roger Tabor, USFWS

What can dissolved oxygen tell us about the condition of water?

DO is considered an important measure of water quality as it is a direct indicator of an aquatic resource's ability to support aquatic life. For the National Aquatic Resource Surveys (NARS), levels of DO are measured with a calibrated water quality probe meter, usually in conjunction with measurements for temperature and pH. While each organism has its own DO tolerance range, generally, DO levels less than 5mg/L are considered stressful for fish and levels less than 3mg/L are too low to support fish. DO levels below 1mg/L are considered hypoxic and usually devoid of life.

How is this indicator used in NARS?

Two surveys collect dissolved oxygen data and report results as an indicator. Data are available on the NARS data page <<https://epa.gov/national-aquatic-resource-surveys/data-national-aquatic-resource-surveys>>. Below the table you access assessment information in current reports.

NLA	NRSA	NCCA	NWCA	Indicator Type
X		X		Core Indicator
				Research Indicator

National Lakes Assessment Web Report- Dissolved Oxygen Results

<<https://nationallakesassessment.epa.gov/webreport/#dissolved-oxygen>>

National Coastal Condition Assessment Web Report- Coming soon

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